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AN ABSTRACT OF THE THESIS OF Jill M. Jordan-Trestik for the Master of Science in Speech Communication: with an emphasis in Audiology.

Title: Survey of Oregon's Public School Hearing Conservation Programs.

APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

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David H. Martinez, D.Ed.

In 1981 the Oregon State Health Division eliminated its direct-service public school hearing conservation program. This change in priority and the implementation of OAR 581-22-705 by the Oregon Department of Education placed the responsibility for hearing conservation with the local school districts.

On an interim basis beginning in 1983, a contract was

established between the Oregon State Health Division and the Crippled Children's Division of the Oregon Health Sciences University to assist the public schools with the transfer of hearing conservation responsibility to local public school control. Most of the school districts were unprepared for this new role.

Following approximately three years of local control, the present study was implemented in order to: 1) determine what hearing conservation activities were provided by the local public school districts within Oregon during the 1984-85 school year, 2) compare these practices with the model program proposed by the American Speech-Language-Hearing Association (ASHA, 1985), and 3) compare the Oregon practices with those revealed by a recent national survey of public school hearing conservation programs as reported by Wall, Naples, Buhrer and Capodanno, 1985.

A survey instrument was designed to yield information regarding hearing conservation activities. This instrument was then distributed to those individuals identified as the coordinators for the various district programs.

The survey instruments returned for analyses represented 96 percent of those districts with elementary schools. Data analyses revealed that most of the children in kindergarten and first grade received effective levels of hearing conservation services during the school year. In contrast, only 13 percent of the children in the second grade and 51 percent of those in third grade received such

services. Although most "special" children received adequate hearing conservation services, only a relatively small number of this group included teacher referrals. Furthermore, children identified as previous screening failures were often overlooked on subsequent screenings.

Considerable variability was observed in supervisory personnel across the state. Three disciplines represented the majority of program coordinators; these were Coordinators of Special Education (37 percent), Speech-Language Pathologists (32 percent), and Audiologists (27 percent). Speech-Language Pathologists performed the majority (68 percent) of the hearing screening related services. Finally, the results indicated that many districts do not provide adequate training to those individuals engaged in hearing related screening activities.

Two major recommendations are suggested based upon the results of this study. First, the Oregon Department of Education should consider the development and implementation of a minimum standard for hearing conservation practices in the public school setting. This may be considered a long-term goal which could evolve through subsequent modifications and improvements in the recommendations for hearing conservation practices as outlined in the manual "Health Services for the School-Aged Child." The ultimate goal should be a minimum standard modeled after those recommended by the American Speech-Language-Hearing Association (ASHA, 1985). Second, the Oregon Department of Educa-

tion in cooperation with the Teacher Standards and Practice Commission and representatives of the Audiology community should work cooperatively work together to develop certification standards for Educational Audiology within Oregon. It seems evident that the wide diversity and variability in current hearing conservation practices within the Oregon public school setting would be virtually eliminated should these two recommendations realize positive response.

SURVEY OF OREGON'S PUBLIC SCHOOL HEARING CONSERVATION PROGRAMS

by

JILL M. JORDAN-TRESTIK

A thesis submitted in partial fulfillment of the requirements for the degree of

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1985

TO THE OFFICE OF GRADUATE STUDIES AND RESEARCH:

The members of the Committee approve the thesis of Jill M. Jordan-Trestik presented November 18, 1985.

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DEDICATION

To my husband and parents for their constant love and encouragement.

To Rod my mentor, colleague, and friend for his generous assistance and support.

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CHAPTER I

INTRODUCTION

The auditory system is the most important input avenue to the brain for the acquisition of oral language. The approximation of one's intellectual potential and general educational progress is primarily an auditory phenomenon, dependent upon intact auditory pathways. It is now recognized that even mild hearing loss can have marked effects upon a child's linguistic and educational performance (Hanson and Ulvestad, 1984).

Silverman and Lane (1970) have estimated that within the United States, communicatively significant hearing loss is present in approximately 2.5 million school-aged children. In order for youngsters with auditory impairment to have an equal opportunity to reach their intellectual potential, it is imperative that their hearing losses be identified and managed as early as possible.

Until 1981 Oregon provided a direct comprehensive state-wide hearing conservation program to the public schools through the Oregon State Health Division. This program made available, among other services, initial and follow-up hearing screening, audiological testing, and medical examination. Due to the changing priorities of the Health Division, in 1981 the budget for hearing

conservation was reduced by approximately 75 percent (Penny, 1984). There was a desire on the part of Health Division management personnel to move away from direct service activities, including hearing conservation services to the public schools.

The extensive program then in place was markedly reduced, and the local school districts were left without the long-standing Health Division support. For the next two years, the Health Division attempted to help the schools by arranging a limited number of individual contracts with some schools, educational service districts, and community speech and hearing centers to provide for certain elements of the former program. Unfortunately, there were insufficient funds to support adequately the documented need utilizing this approach. While some schools were able to continue at a modest level of activity, others were left without any hearing conservation services.

Since the multiple contract concept did not provide an even distribution of services to all public schools, in 1983 the Health Divison approached Crippled Children's Division (CCD) of the Oregon Health Sciences University with a request that CCD develop a proposal to assist school districts in developing their own local hearing conservation programs. At approximately the same time, the State Department of Education implemented OAR 581-22-705 which required public schools to establish hearing

screening activities (Oregon Department of Education, 1984). This administrative rule did not elaborate on the required elements of a hearing conservaton program; although it listed guidelines, it set no minimum standards.

The contractual agreement between CCD and the Health Division provided for a number of components which were designed to assist the public schools with a transition from a state managed program to one of local control. The Health Division recognized that the school districts were now required to establish and maintain their own hearing conservation programs, a requirement for which most districts were not fully prepared. In an effort to assist the schools through the transition, the contract between CCD and the Health Division was implemented. The main elements of this agreement were as follows:

1. short term loan of state-owned hearing and middle ear screening equipment;

2. technical assistance and consultation regarding the establishment of an effective hearing conservation program;

3. development and distribution of a Hearing Conservation Program Guide;

4. an annual state-wide hearing conservation workshop; and

5. the provision of hearing aids to financially eligible chidren.

Statement of the Problem

The Oregon State Health Division no longer provides a direct service state-wide hearing conservation program to the public schools. The State Department of Education now requires the public elementary schools to perform hearing screening; however, no minimum standard has been set to guide the districts with the development of their individual programs. The contractual arrangement between CCD and the Health Division was designed to assist the districts with assuming this responsibility. The present study was designed to ascertain what hearing conservation activities were in effect within Oregon's public schools following approximately four years of local control. The following research questions were therefore posed:

1. What hearing conservation activities were being provided by the local school districts?

2. How did hearing conservation activities in Oregon compare to a model program proposed by the American Speech-Language-Hearing Association (ASHA, 1985)?

3. How did hearing conservation activities in Oregon compare with the results of a recently published nation-wide study on current hearing conservation practices (Wall, Naples, Buhrer, and Capodanno, 1985)?

CHAPTER II

REVIEW OF THE LITERATURE

This chapter will discuss reasons for the development of hearing conservation programs, Oregon's history of hearing conservation in the public schools and results of a recent nation-wide survey.

Development of Hearing Conservation Programs

As many as 50 of every 1000 children exhibit some degree of hearing loss in one or both ears (Eagles, Wishik, and Doerfler, 1967). Causes of decreased hearing sensitivity include blockage of the external auditory meatus, cochlear trauma, acoustic nerve tumors, and hearing loss due to ototoxic drugs or noise. A major cause of decreased hearing sensitivity in children is middle ear disease which is considered one of the most common childhood illnesses. Otitis media in its various forms, including middle ear fluid and infections, as well as perforations of the tympanic membrane, bullous myringitis, and cholesteatomas are some of the many types of middle ear problems.

The prevalence of otitis media is difficult to report due to the variability in methods and designs used in the epidemiologic studies. Nevertheless, the greatest incidence of otitis media seems to be during the first two

years of life, gradually declining thereafter (Paradise, 1980). According to Howie (1975), children who experience otitis media early in life are more likely to endure more severe and recurring episodes of this disease complex than are those for whom the first occurrence is later in life. Figure 1 demonstrates the relationship between the frequency of occurence of otitis media and age. Factors associated with this phenomenon in children include a greater incidence of upper respiratory infection, associated eustachian tube dysfunction, allergies, and anatomical deviations (Paradise, 1980).

The earlier a hearing loss is identified, the more likely the affected child will not experience the associated problems of communicative, educational, and intellectual delay. Early identification is the first step in effective management (Bess and McConnell, 1981). Since the majority of children within the United States do not come together in one setting until kindergarten or first grade, it is considered prudent to establish complete and effective hearing conservation programs during these early important years. Earlier identification and management strategies are important considerations; however, no practical system has yet been devised to realize this goal.

Wall et al. (1985) conducted a nationwide survey of hearing conservation activities. Questionnaires were sent to 1889 people, 551 (30 percent) of whom responded. The respondents were a variety of professionals including

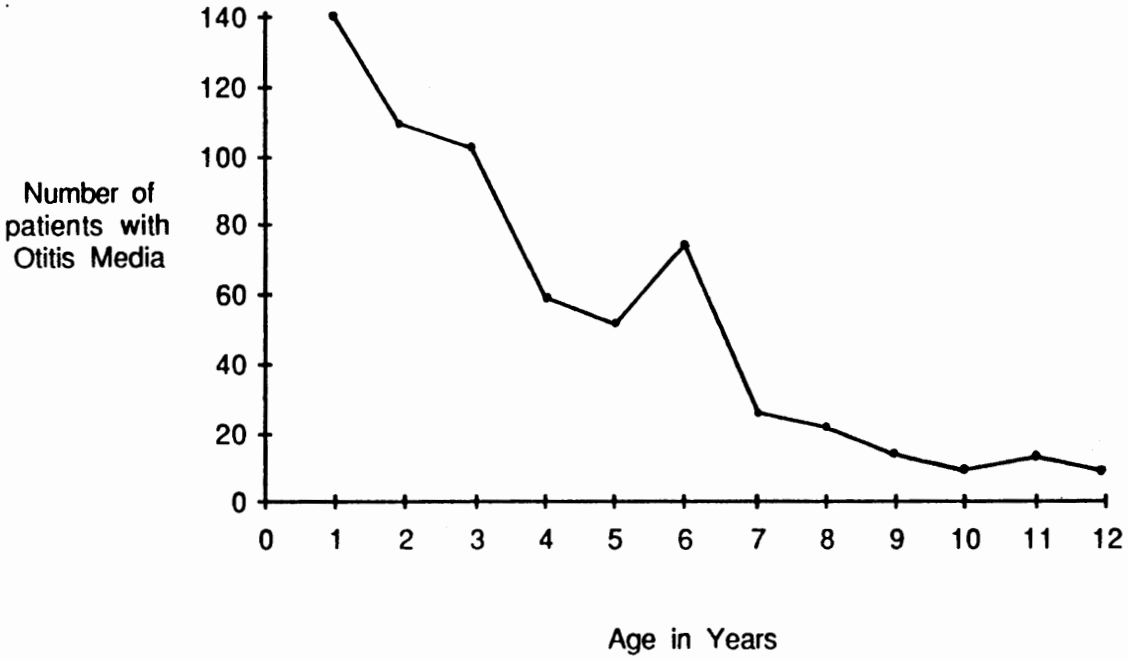

Figure 1. The relationship between age and otitis media for 488 patients followed from birth in a pediatric practice. (Redrawn from Howie, V.M. Natural history of otitis media. Ann. Otol. Rhinol. Laryngol. Suppl. no. 19 84, 67-72 [1975].)

nurses, speech-language pathologists, audiologists and communication disorder specialists. A general agreement was observed that kindergarten and first grade are considered to be the two most frequently involved age groups regarding hearing conservation activities. A general decline in the amount of testing of students was noted as grade level increased which corresponds to the relationship between age and middle ear disease. Other high priority groups for hearing screening are "special" children, including youngsters new to the school, children in special education classrooms, those with a history of hearing loss, children who have failed screenings in the past, and students referred by a teacher for questionable hearing.

Currently, there are no federal regulations which require states to maintain hearing conservation programs within the schools; albeit, the concept exists in various forms in most states. It has been supported with federal money in a variety of ways; however, this support has diminished to virtually non-existent levels.

History of Public School Hearing Conservation in Oregon

Oregon can be viewed as a leader in the development of public school hearing conservation activities. The initial program was started in 1937 when the Oregon State Board of Health implemented the first attempts in this state (Gardner, 1941; Anderson, 1981). From 1937 through 1939, the program was funded by the United States

Children's Bureau. From the outset, the primary goals of this new endeavor were to identify school-aged children with educationally handicapping hearing loss and to initiate appropriate steps to eliminate the loss or reduce its effect.

The Program evolved through many changes over the ensuing years; however, the primary goals of identifying and managing children with hearing loss remained the same. In 1949 federal funding came to the program through the Division of Maternal and Child Health. The managers of the Oregon activities at that time believed a complete hearing conservation program required a cooperative effort between several organizations, i.e., local health departments, the medical community at large, civic organizations, and the schools. Hearing screening was accomplished with a procedure called the Fading Numbers Test, a technique which allowed as many as forty children to be screened at one time. A follow-up of the initial testing was provided to those children who failed the first screening, preferably during the same day. Youngsters who failed a second screening received an individual pure tone threshold test at a later date.

The second phase of this early program consisted of a medical official from the local health department examining each child who failed the pure tone test. The results of this preliminary medical check, along with the audiogram, determined whether or not a child was referred for an oto-

logic examination. When referral was indicated, a meeting with the parent was scheduled to explain the test results, to obtain information about the family's history of hearing health, and to inform the parents of the need for medical attention for their child. A public health nurse visited the homes of parents who were not able to go to the school for such a meeting. Once the parent identified the physician who would be seeing the child, a copy of the audiogram was forwarded. The physician was asked to diagnose and treat the problem as appropriate and recommend educational management.

The hearing conservation activities continued to change during the 1950's. A more elaborate program began to develop. During this time grades K, 1, 3, 5, 7, and 9 were screened. Screening also included all teacher referrals and new students.

The initial screening continued to consist of testing groups of children, now utilizing the newly-developed Johnston Test. This approach allowed for the simultaneous screening of as many as ten children utilizing pure tone stimuli. Those who failed the Johnston Test were given individual pure tone threshold tests on the same day by an audiologist. Six test frequencies were used: 500, 1000, 2000, 3000, 4000, and 6000 Hz. Threshold results for the three lower frequencies and the three higher frequencies were separately averaged. Criteria for failure consisted of an average loss of 20 dB HL or greater in the three

lower frequencies and 25 dB HL or greater in the three higher frequencies in either ear. A child failing the threshold test was referred to his family physician.

A new concept was added to Oregon's program in 1959 with the introduction of otology clinics in six counties. These clinics were held at the local health departments and included an audiologist to provide audiological testing and an otologist to provide medical evaluation and diagnosis. The otology clinics increased in number until in 1965 they were provided throughout the entire state. In the larger counties, audiologists provided further auditory evaluations within the schools, typically four to six weeks after the initial screening failures were identified. This test battery included otoscopy, pure tone air conduction threshold testing, and bone conduction. Around this time it became evident that screening the seventh and ninth grade students was not cost effective since relatively few losses were identified. Interestingly, this reduced activity level is supported by the literature which reveals a reduced incidence of both middle ear disease and identified hearing loss in older children (Howie, 1975).

In 1966 a hearing aid dispensing program was implemented in Multnomah County. Children determined to be financially eligible who met the audiological criterion of communicatively significant hearing loss were provided with amplification. Within three years, the hearing aid provision aspect of the program was in operation state-

wide.

The Oregon program remained largely unchanged from 1966 until 1976 when impedance audiometry was added to the follow-up protocol. By this time Oregon had a reasonably complete program. It employed three licensed audiologists and eight trained audiometric technicians and was viewed by federal representatives of the Division of Maternal and Child Health as a model program. It continued to function until reductions in the Health Division budget in 1981. This budgetary action along with the implementation of OAR 581-22-705 placed the responsibility for hearing conservation directly with the local school districts.

Results of a Nation-Wide Survey

There are two philosophies with regard to the purpose of hearing conservation activities: 1) the identification of educationally handicapping hearing loss, and 2) the detection of middle ear disease (Wilson and Walton, 1978; ASHA, 1985). Wall et al. (1985) reported that most individuals involved in the hearing conservation activities believe the purpose is a combination of both.

According to Wilson and Walton (1978), personnel directing the hearing conservation services should be selected after the purpose for the program has been determined. When the major reason for screening is to identify the presence of middle ear disease, they suggest that health personnel supervise the program. On the other

hand, if the goal is to identify handicapping hearing loss, then professionals who manage hearing impaired children should direct the activities. Wall et al. (1985) found that most of the supervision for hearing conservation was provided by school and public health nurses (66 percent); the remaining supervision appears about equally divided between speech-language pathologists and audiologists (23 percent and 24 percent, respectively).

It is often difficult to determine who should perform the screening activities. Alpiner (1971) suggested that speech pathologists do not have the time due to their other responsibilities; therefore, he proposed that screening should be provided by school nurses and volunteers. From survey resuls, Wall et al. (1985) reported that persons performing the screening activities came from a variety of backgrounds. Approximately 65 percent of the testing was performed by nurses, 33 percent by speech-language pathologists, 22 percent by technicians, 19 percent by volunteers, and 16 percent by audiologists. Training for those performing the hearing conservation testing was received by approximately 75 percent of the respondents. Of this number, 47 percent reported that training was mandatory. The majority of the training was provided by audiologists (46 percent) and nurses (45 percent) with a smaller proportion provided by speech-language pathologists (14 percent). Seventy-seven percent believed that the training met their needs in preparing them for administering the screening

tests.

Wall et al. (1985) reported that an overwhelming majority of hearing conservation programs were using pure tone audiometers. Moreover, most (95 percent) agreed that the frequencies of 1000, 2000, and 4000 Hz should be included in the screening. Approximately 80 percent included 500 Hz, and a smaller number (24 percent) used 250 Hz. Intensity levels varied from 15 dB HL to 30 dB HL. The majority used 20 dB or 25 dB HL at 1000, 2000 and 4000 Hz.

Failure criterion for the screening was a lack of response at one frequency for either ear (58 percent). Thirty-five percent of the respondents used a two-frequencie failure criterion.

Respondents who indicated using impedance measurements applied them in conjunction with pure tone testing. Referral criteria based on impedance results were a flat tympanogram (66 percent) or abnormal middle ear pressure which was defined as greater than +100mm H_2O, or more negative than -200mm H_2O (65 percent). Absence of the acoustic reflex was the referral criterion for approximately 17 percent. A combination of both abnormal middle ear pressure and absence of the acoustic reflex was used by 33 percent. Seventy-four percent rescreened tympanometry if the child failed the initial screening.

When children required further examination, the most common referral was to the family physician (61 percent).

Otologists, audiologists and pediatricians followed in order with 54 percent, 38 percent, and 33 percent, respectively. Eight percent reported referral to speech and hearing centers or health clinics. Ninety percent of the respondents provided a follow-up mechanism after referral for medical and/or audiological management.

The screening environment differed among the respondents. The majority (73 percent) reported their screening was performed in offices, others used classrooms (29 percent), and 24 percent reported a variety of other places, such as, closets and in one example a VW van parked outside the school. Wall et al. (1985) suggested that the reported screening environments were generally inadequate to meet testing needs, primarily because of excessive noise.

In addition to the identification and medical management of hearing problems, Wall et al. (1985) studied the school based management of those students with impaired hearing. Nationally it appears that speech-language-hearing intervention was the primary service provided to offset the effects of hearing loss and was an integral part of hearing conservation programs. In contrast, resource rooms, hearing aids, and related services and preferential classroom seating were utilized on a more limited basis.

The American Speech-Language-Hearing Association Model

In 1985, the American Speech-Language-Hearing Association Committee on Audiologic Evaluation revised the

1975 guidelines for identification audiometry (ASHA, 1985). It was recommended that individual pure tone air-conduction screening should be performed in order to identify hearing impairments which have the potential for disrupting communication.

Screening should include the frequencies 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz each presented at 20 dB HL (re: ANSI-1969). It was suggested that 500 Hz may be eliminated from the protocol if the program utilized immittance screening. Failure criterion for the hearing screening was failure to "respond" to the stimuli at one or more test frequencies for either ear. Persons who fail the screening should be rescreened within two weeks. Those failing the second screening should receive an audiological assessment by an audiologist. When a hearing loss is identified, referral for habilitation, education and medical evaluation should be made.

ASHA advocated that programs should be supervised by audiologists. However, screening may be performed by anyone who has been appropriately trained. Environmental noise levels in the room where the screening will be performed should meet the ANSI S3.1-1977 specifications for permissible ambient noise. Audiometers utilized in hearing screening should meet ANSI S3.6-1969 specifications for audiometers and should be rechecked at least annually. Biological listening checks are to be performed daily.

This chapter has reviewed the development of hearing

conservation programs, presented a historical overview of hearing conservation programs in Oregon and discussed results of a 1985 nation-wide survey. The following chapters will discuss the methods, procedures, results and a discussion of a state-wide survey of Hearing Conservation Programs in Oregon.

CHAPTER III

METHODS AND PROCEDURES

Methods

To determine the current status of public school hearing conservation throughout Oregon since the transfer of responsibility from Health Division to local control, a state-wide survey was developed.

Respondents

The respondents who participated in this study consisted of persons identified by the school districts as the individuals directly responsible for the district hearing conservation activities. These program coordinators were requested to participate in this research project through a cooperative effort by the Oregon State Department of Education and the Crippled Children's Division, Oregon Health Sciences University.

Instrumentation

The hearing conservation survey instrument (Appendix A) was a revision of one intially developed by Pelson (1983). It was designed to yield information regarding individual hearing conservation programs. The 1983

instrument was modified a number of times by this investigator, the audiology staff of the Crippled Children's Division and the Special Education and Student Services staff of the State Department of Education. After the two facilities agreed upon an acceptable draft, the Health Committee Workgroup reviewed the instrument and provided comments. This fifteen-member Workgroup consisted of school health nurses, a representative from the Health Division, school administrators and a psychiatrist. The final draft incorporated suggestions from the Workgroup and final revisions from both the Department of Education and the Crippled Children's Division. The final version of the questionnaire was divided into three general categories as the following paragraph describes.

In order to help clarify the difference between hearing screening as opposed to a hearing conservation program, the first category listed the five major components of a basic hearing conservation program from identification through management. It was meant only to be informational in nature and directly reflects the Hearing Conservation Program Guide (Pelson and Young, 1983) distributed to all school districts on two occasions during the two years prior to the survey project.

The second category was a demographic category which consisted of two open-ended questions. These were designed to identify the individual completing the questionnaire, as well as the respective school district and county

represented.

The third category was composed of thirty-two descriptive questions concerning various aspects of current hearing conservation activities. Nine were open-ended questions and could be answered in one or two words. The remaining twenty-three questions were forced-choice.

Procedures

The investigator in collaboration with personnel from the Department of Education, developed a memo (Appendix B) which was sent to the superintendents of the 284 school districts with elementary grades. The memo was designed to accomplish several objectives. It requested that the individual responsible for the local program be identified along with mailing address and telephone number. Further, the memo informed the district personnel of the Hearing Conservation Program survey and when the instrument would be distributed. A self-addressed envelope was included for return to the investigator at Crippled Children's Division. A follow-up memo (Appendix C) was sent approximately two months later to districts which failed to respond to the initial request. After the author received the initial information, each potential respondent was contacted by telephone to verify his/her ability to provide the data requested in the questionnaire.

The survey instruments, cover letters and return envelopes were mailed subsequently to the contact persons on

March 1, 1985. The cover letter (Appendix D) stated that April 5, 1985 was the date by which the questionnaires were to be returned to the investigator.

The questionnaires were reviewed upon their return. Telephone and written contact was then made to the appropriate respondents regarding incorrect and/or incomplete questionnaires for further data collection.

Data Analysis

Data were transferred from the survey instruments directly onto a computer system. Initial analyses were conducted of the frequency of response for each possible answer. The author realized that all possible responses to specific questions were not fully addressed by the limited possible choices; therefore, a category of "other" was established in order for the respondent to more fully explain a response if necessary. The means, modes, and the ranges of frequency of responses were calculated using the FREQUENCY routine of the Statistical Package of the Social Sciences.

The author individually analyzed the responses to the nine open-ended questions. Similar responses were grouped together. The demographic data were analyzed in order to determine what counties and school districts were represented by each survey instrument.

The current Oregon public school hearing conservation practices were then compared to the ASHA (1985) guidelines

and to the results of the national survey by Wall et al. (1985) using descriptive statistics.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this study was to: 1) determine what hearing conservation activities were provided by the local public school districts within Oregon during the 1984-85 school year, 2) compare these practices with the 1985 model program proposed by the American Speech-Language-Hearing Association (ASHA, 1985) and 3) compare the Oregon practices with those revealed by a recent national survey of public school hearing conservation programs, (Wall et al. 1985). Due to the complexity of the survey data, discussions of the results will be incorporated, as appropriate, in this chapter.

Oregon had 284 school districts with elementary grades, many of which also included kindergarten classes. A total of 102 individuals were responsible for the hearing conservation programs in effect within these 284 districts. Ninety-five questionnaires (93 percent) were included ultimately in data analysis. The ninety-five respondents who returned questionnaires represented 274 (96 percent) of the surveyed districts. The mean number of school districts represented per respondent was 2.88, with a range of 1 - 30. Ten districts (the remaining 4 percent) did not respond to the survey.

Major Program Elements

The major elements of a hearing conservation program according to the program guide developed by Pelson and Young (1983) are: 1) initial hearing screening, 2) follow-up hearing screening, 3) audiological evaluation, 4) medical evaluation, 5) hearing re-check after medical referral, and 6) educational considerations. Each of these components will be discussed regarding the results of this study.

According to the 1984 Oregon public school enrollment statistics (Department of Education, 1985), there were approximately 134,000 children enrolled in the school system within grades K-3. Table 1 summarizes enrollment by grade level and the number of children who reportedly received initial hearing screening during 1984-85. These data revealed that 59 percent (approximately 79,000) of the total enrollment received an initial screening. In contrast 55,000 children (41 percent) received no screening services. Further inspection of the data demonstrated that virtually all kindergarten children (98 percent) and the majority of the first graders (83 percent) were screened. On the other hand, only 13 percent of the second and 51 percent of the third grade students received initial screening service.

Figure 2 illustrates that the initial screening services provided in Oregon were consistent with the

TABLE I

A COMPARISON OF THE NUMBER OF CHILDREN ENROLLED TO THE NUMBER SCREENED

Number of Children	Kinder.		First		Second		Third	
	N	(%)	N	(%)	N	(%)	N	(%)
Enrolled	23,500		40,000		35,000		35,000	
Screened	23,000	(99%)	33,000	(83%)	4,600	(13%)	18,000	(51%)
Not Screened	500	(01%)	7,000	(17%)	30,400	(87%)	17,000	(49%)

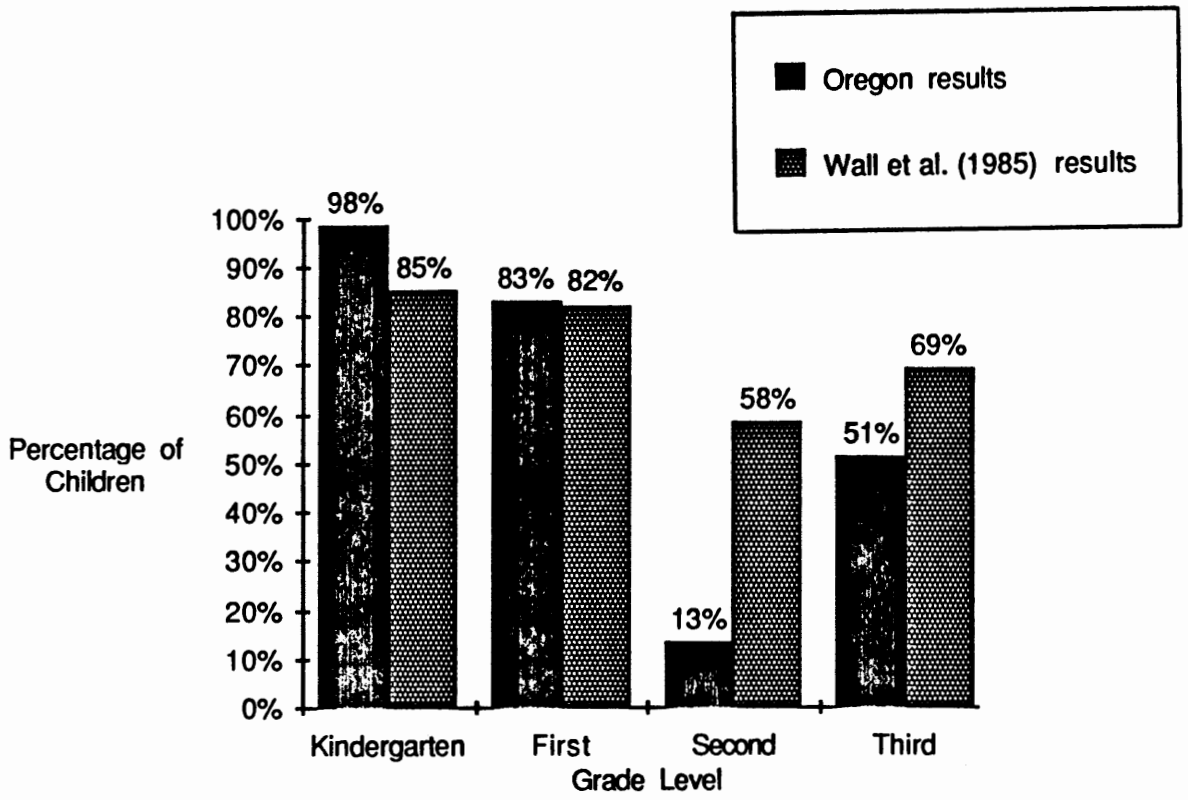

Figure 2. Percentage of children by grade level in Oregon who received initial screening compared to results reported by Wall et al. (1985).

national trend of screening most of the children in kindergarten and first grade. Conversely, there was marked inattention to the second graders and a renewed yet incomplete screening of third. This current phenomenon can be explained in part by the hearing conservation guidelines outlined by the Department of Education (Dept. of Education, 1984). These guidelines suggested screening grades K, 1, and 3 only. This also is consistent with Oregon's history of hearing screening every other grade following the first grade. The reason that only 51 percent of the third grade pupils were screened is unclear, but may relate in part to local funding and staffing problems.

The ten school districts not represented in the study had a total of 4600 children enrolled in K-3. The screening services provided to these children are not known.

In addition to the 79,000 children in K-3 who received initial screening services, an additional 14,700 other youngsters were also screened. These included children in grades 4-12 and "special" students. The category of "special" refers to students in special education classes, students new to the district, teacher referrals, previous screening failures, and a sub-group called "other", which consisted of students at risk for hearing loss and those who received speech and language intervention.

Figure 3 compares the results of the present study

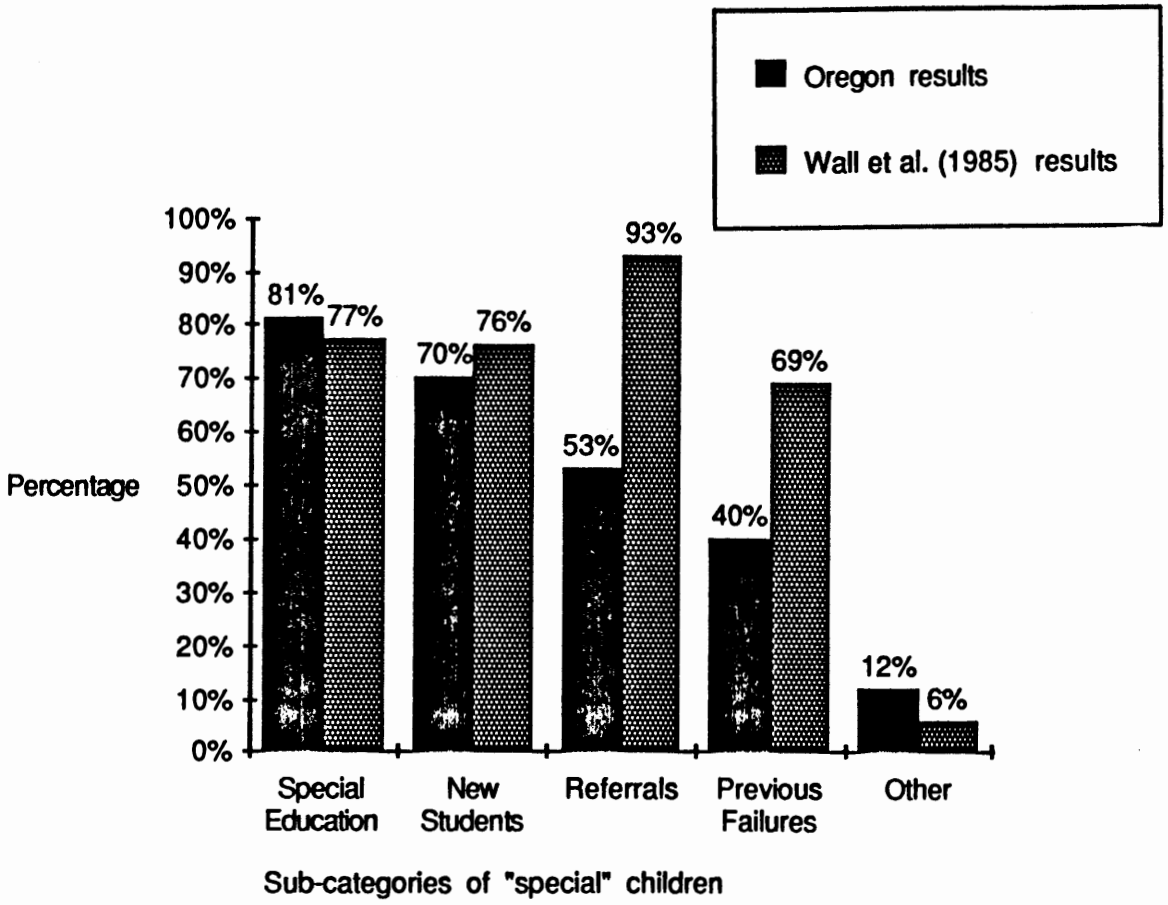

Figure 3. Comparison of the results of the "special" children screened by Oregon and those reported by Wall et al. (1985).

with those of Wall, et al. (1985) with regard to "special" children. The Oregon hearing screening performance level for children in the "special" category appeared to be generally consistent with what was seen nationally. This is especially true for children in special education and students new to the districts. However, the Oregon schools screen significantly fewer youngsters in the categories of teacher referrals and previous screening failures than occurred nationally.

The ASHA model (ASHA, 1985) specifically referred to children considered high risk for hearing loss. It included youngsters in special education programs, new students, those absent during screening, previous failures, grade failures, students with speech and language problems, those with medical problems associated with hearing loss and youngsters in classes with high sound levels (i.e., band, woodwork, and metal shop classes).

It seems clear that the hearing conservation programs currently in place within the Oregon public schools need to have increased emphasis upon hearing screening of "special" children. While Oregon appeared to be approaching reasonable service levels for students in special education classes and those new to the districts, a substantial increase in service levels is needed within all other subcategories outlined by ASHA (1985). The ASHA model is comprehensive in this aspect and reasonable. As with all elements of a comprehensive hearing conservation program,

the major responsibility for the screening of "special" students rests with the program supervisors. These individuals have direct knowledge of all previous screening failures and can readily ascertain who is enrolled in special education classes, as well as students new to the district. Yet, program managers had to rely upon other educational personnel for the identification of certain subcategories of "special" youngsters. Herein enters the need for the education of teachers, school aides, and other educational personnel about referral criteria for hearing screening.

The next important element in the hearing conservation process for children who failed the initial hearing screening was the provision of follow-up screening due to failure on the initial testing. Of the 79,000 students in K-3 who received initial testing, data revealed that an average of 13 percent were given follow-up screening. Figure 4 displays the percentage of children who received follow-up screening by grade level.

The Wall et al (1985) survey did not reveal the percentage of students who received follow-up screening. However, Bebout (1985), reporting on the 1983-84 hearing conservation program in Iowa, indicated that approximately 25 percent of all children received initial screening required follow-up testing. Results for the 1984-85 school year in Iowa revealed 17 percent of the children who received initial screening required follow-up testing

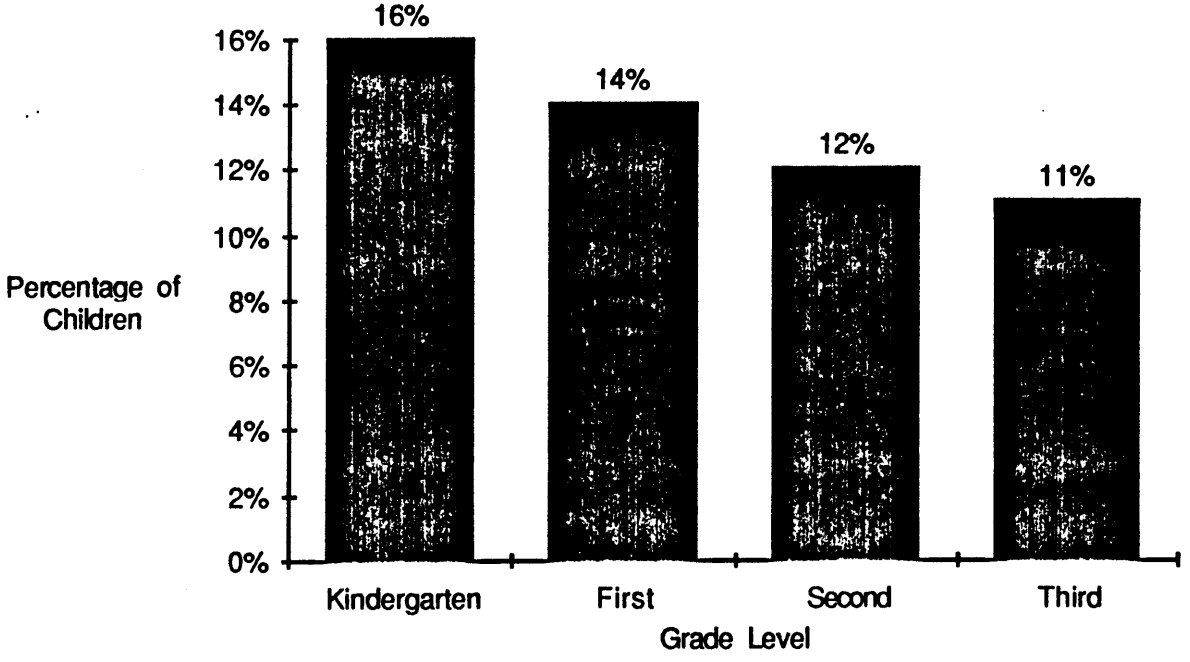

Figure 4. Percentage of children initially screened in Oregon by grade level who received follow-up hearing screening.

(Brown, 1985). Ideally, children only fail because their hearing levels are elevated. Unfortunately, other reasons occur, including: misunderstanding the task and/or poor instruction, and elevated ambient noise levels which mask the screening stimuli.

The reason for the rather substantial difference between the follow-up rate in Oregon and that reported for Iowa may relate to several factors. The program in Oregon has been in transition, while the program in Iowa is a well-established program. Furthermore, Oregon has had several different disciplines managing the various programs. The Iowa program is managed by audiologists. Finally, there exists quite variable programs across school districts within Oregon. In contrast, Iowa has a more cohesive program across the state.

Follow-up percentage as a function of grade level was as one would predict, i.e., a greater percentage of children received follow-up testing in kindergarten than first grade and so on. This phenomenon probably occurred for two reasons. First there is a well documented decrease in the incidence of middle ear disease with increasing age (Howie, 1975). Second, children generally understand the screening task better as they get older which results in fewer false positive identifications during the initial screening.

The 1985 ASHA model clearly states all failures of the follow-up screening need to receive audiological

testing prior to medical evaluation. There were several reasons for this recommendation. First, not all failures need medical evaluation. For example, some middle ear problems resolve before audiological testing; as noted some children do not understand the screening task; occasionally improper testing results in false positives. Second, the audiologist provides the otolaryngologist with definitive auditory data. Third, audiologists can provide suggestions regarding educational considerations for hearing impaired children. This may be particularly important for certain children prior to receiving medical evaluation and/or management. Even so, many programs in Oregon do not follow ASHA guidelines.

Wall et al. (1985) reported only 38 percent of the respondents referred to an audiologist, while 61 percent referred to the family physician, 54 percent to an otologist and 33 percent to pediatricians. Some respondents referred to more than one discipline; therefore, the percentages do not sum to 100.

Analyses of the data generated by the current project indicated marked variability across school districts in their referral sources. In general, 2.5 percent (n = 1980) of those children initially screened received an audiological evaluation. On the other hand, 3.5 percent (n = 2800) of the screened group were referred for medical consultation. While it can be assumed there was considerable overlap between audiological and medical

referral, it was clear that many districts referred directly to medical specialists after the initial or follow-up screening failure without the benefit of definitive audiological study to document and thus support the need for such referral. It is clear Oregon is consistent with the national trend of not utilizing audiologists to the extent ASHA recommends.

After medical referral, the next major program element is a hearing re-check; this element is somewhat unique to the Oregon model (Pelson and Young, 1983). They recommend that children referred for medical evaluation be rescreened after their referral appointment in order to determine whether or not the problem has been resolved. The percentages of Oregon children who received a hearing re-check after their medical referral are illustrated in Figure 5. These results demonstrate that the majority of children suspected of having hearing problems were not re-checked to determine if the problem had been corrected.

There are several reasons why a re-check after medical evaluation is important. First, it is naive to assume that the family will follow the recommendation to see a physician. Second, one cannot assume that the physican will necessarily correct the problem which produced the hearing loss. Third, one cannot be assured that the most appropriate medical discipline will be sought. Fourth, sensorineural hearing loss is not medically treatable and can only be managed with

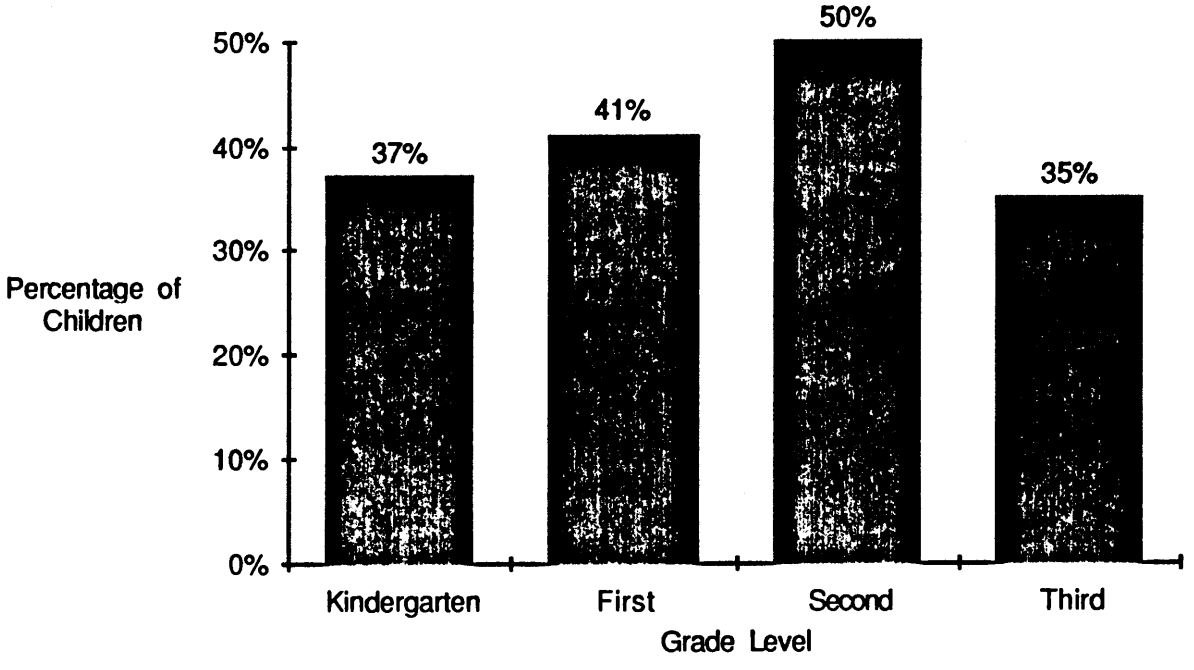

Figure 5. Percentage of children who received a hearing re-check following medical referral.

appropriate non-medical schemes. Fifth, a hearing re-check would help identify those with persistent problems.

The last major element of a hearing conservation program is the management of children identified as hearing impaired. The number of Oregon children who received educational management was a small percentage of those who were initially screened. Of the 79,000 children in K-3 grades who were initially screened, 1 percent (n=790) received educational management services. Figure 6 portrays the data by grade level. It is conceivable that if approximately 1 percent of the children initially screened require educational management services, then an estimated 1 percent of the 55,000 children who did not receive screening services also need educational management services. Therefore, as many as 550 children who would require educational management services are not receiving them.

A review of the qualitative data revealed that hearing impaired children were managed in a variety of ways. Most Oregon school districts provided several educational services for children with confirmed hearing loss. The majority of the districts provided preferential seating, speech and language intervention, special educational placement, amplification and utilization of resource rooms.

Not every hearing impaired school-age child requires all of these services which may be available in a given

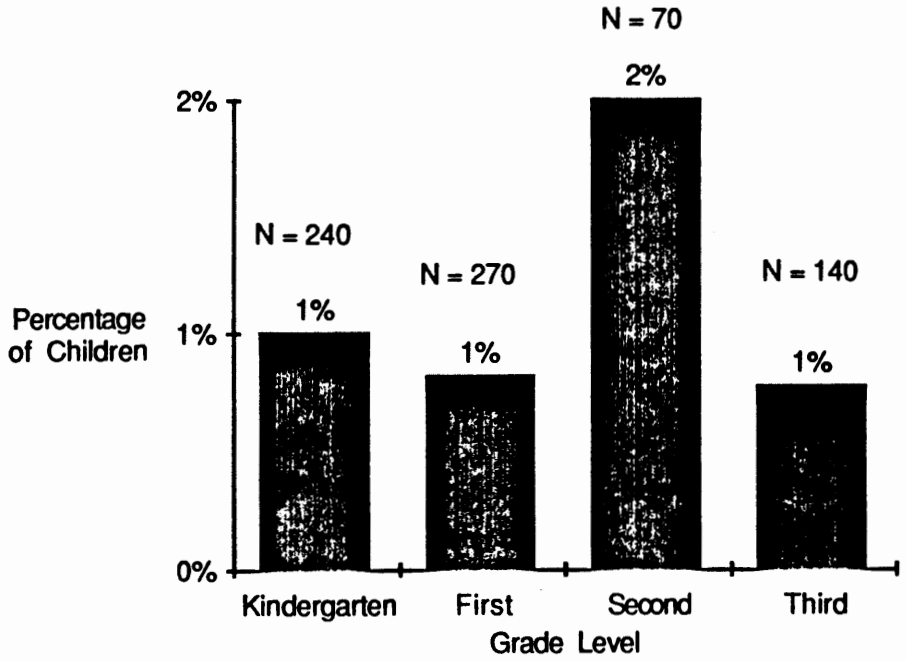

Figure 6. Percentage of children initially screened who received educational management for hearing loss.

district. Districts typically have available a variety of services but utilize these as dictated by particular student's needs. For example, students with moderate hearing loss or greater may need support provided by resource rooms. Some children with hearing loss may need speech-language support; all do not. In contrast, virtually all hearing impaired children need preferential seating, and every effort should be made to accommodate this need. It is important that the child maintain an optimum visual and acoustic environment. Virtually all hearing impaired children can benefit from amplification. On the other hand, Frequency Modulated (FM) auditory trainers are benefical for some children, typically those with moderate or greater hearing loss. Most Oregon schools provide amplification hearing devices.

Wall et al. (1985) indicated that the most common type of management for identified hearing impaired children was speech-language-hearing intervention (76 percent), although they did not clarify what this entailed. Other types of management included hearing aid orientation (40 percent), information on hearing loss and prognosis (52 percent), and classrooms for the hearing impaired (44 percent). ASHA (1985) has recommended that referrals for habilitation and education be considered as important components of hearing conservation programs, but did not elaborate on what these should be. The results of the present study indicated that the majority of educational

management services were available in Oregon and that these were generally utilized as needed.

Screening Procedure

ASHA (1985) recommended manually administered individual pure tone audiometric screening as the hearing test of choice for hearing conservation programs. When immitance screening is a component of a hearing conservation program, pure tone air-conduction audiometry should include testing at 1000 Hz, 2000 Hz, and 4000 Hz. For those programs which do not use middle ear screening techniques, it is recommended that 500 Hz be incorporated into their protocol. Wall et al. (1985) reported a general compliance with ASHA guidelines (1985) with regard to screening frequencies. Figure 7 compares the results of the Wall et al. (1985) study and the present investigation. There appears to be little variability in the use of 1000 Hz, 2000 Hz, and 4000 Hz, suggesting concensus on the use of these frequencies across the country. Other test frequencies are used relatively minimally in Oregon, which also is in keeping with the national trend and consistent with ASHA (1985) recommendations.

ASHA (1985) recommended the screening intensity level for all test frequencies of 20 dB HL (re: ANSI 1969). Wall et al. (1985) found that the reported intensity levels ranged from 15 dB HL to 30 dB HL. The suggested intensity level of 20 dB HL was used at 500 Hz by

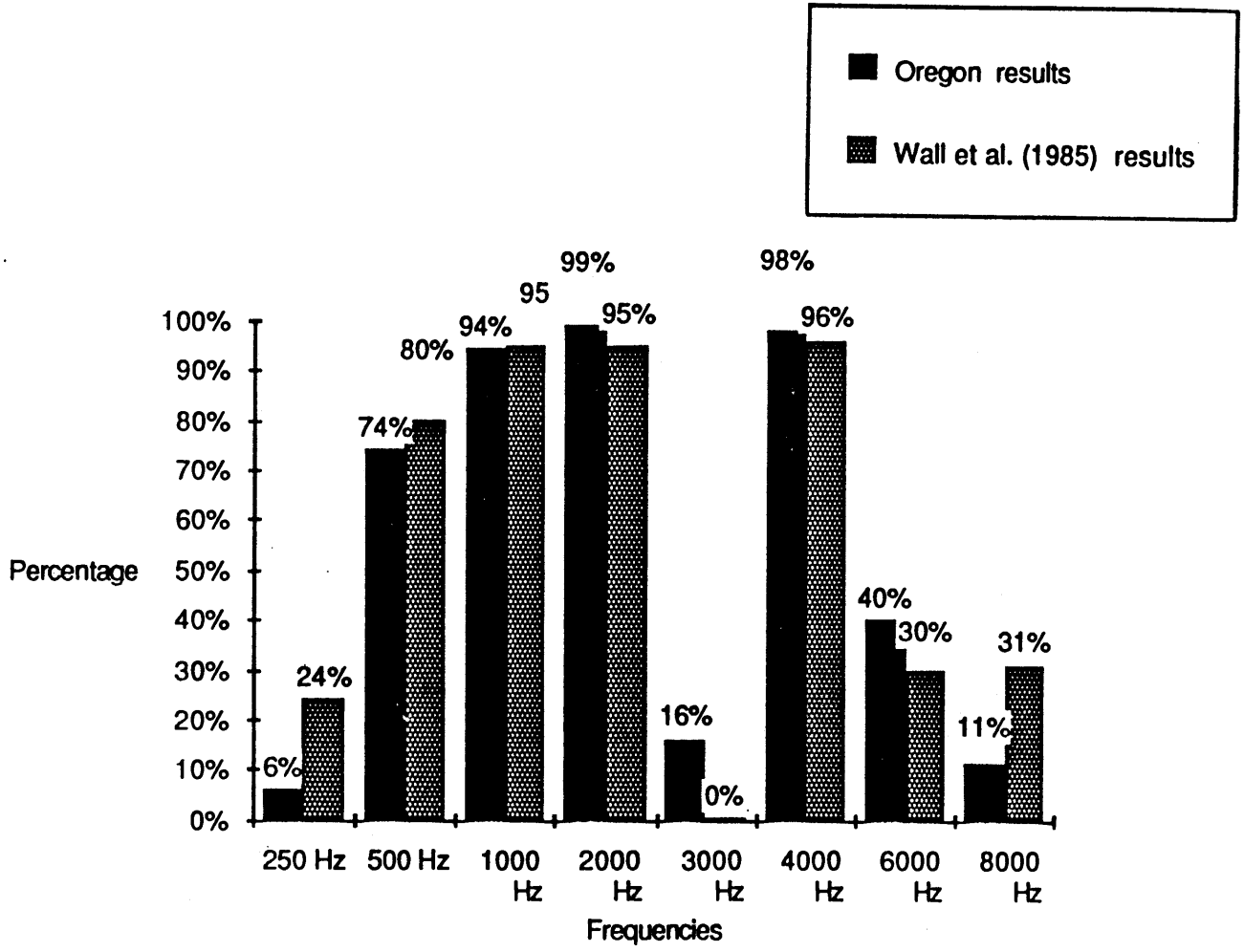

Figure 7. Results of reported screening frequencies utilized in Oregon compared to those reported by Wall et. al (1985).

22 percent of the respondents (n=124), at 1000 Hz by 46 percent of the respondents (n=256), at 2000 Hz by 47 percent of the respondents (n=259), and at 4000 Hz by 34 percent of the respondents (n=185). The current project revealed much less variability within Oregon in regard to intensity level when compared to national findings. Reported intensity levels were as follows: 10 dB (7 percent), 15 dB (16 percent), 20 dB (77 percent), 25 dB (25 percent). These data are shown in Figure 8.

The majority (77 percent) of districts used 20 dB HL; however, a significant number used another intensity level for at least one frequency. One reason 25 dB HL was used by 25 percent of the respondents may be due to the 1975 ASHA guidelines, which recommended 25 dB HL as the intensity level of 4000 Hz. The Oregon State Department of Education used this source for their criteria; therefore, persons using these guidelines for their protocol would not be screening at the currently recommended level. The rationale for a small number of districts utilizing 10 dB HL and 15 dB HL is unclear, but probably reflects a lack of attention to the available literature.

Another consideration in hearing screening involves the time of year when this activity is performed in the schools. It seems prudent to complete hearing screening services early in the school year, thus allowing for earlier resolution of identified hearing and middle ear problems. The majority of the hearing screening in Oregon

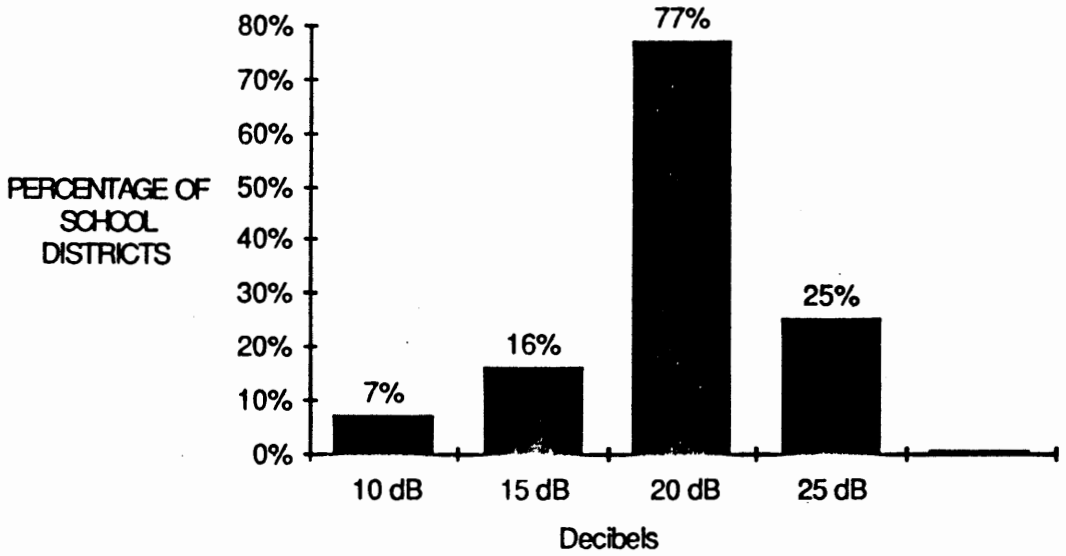

Figure 8. Reported intensity levels.

was performed in the Fall (75 percent); the remainder was performed in the Winter (21 percent) and Spring (4 percent). Wall et al. (1985) and ASHA (1985) did not comment on this aspect of a hearing conservation program.

Hearing Conservation Personnel

A well organized and supervised program is the most effective. According to the ASHA guidelines (1985), hearing conservation programs should be supervised by audiologists. Due to the training they receive, audiologists are well qualified for this responsibility. Wall et al. (1985), however, found that the majority of supervision was provided by public health and school nurses (66 percent), followed by audiologists (24 percent) and speech-language pathologists (23 percent). Results of the current study indicated that less than one-third (27 percent, n=73) of Oregon's hearing conservation programs were managed by audiologists as recommended by ASHA. Surprisingly, more supervision was provided by coordinators of special education (37 percent, n=102) who often have little or no training in hearing conservation. Speech-language pathologists (32 percent, n=89) supervised approximately one-third of the programs, a figure that was slightly higher than the percentage reported by Wall et al. (1985). Figure 9 compares supervisors by discipline reported in this study with the patterns observed by Wall et al. (1985). While there are some similarities between

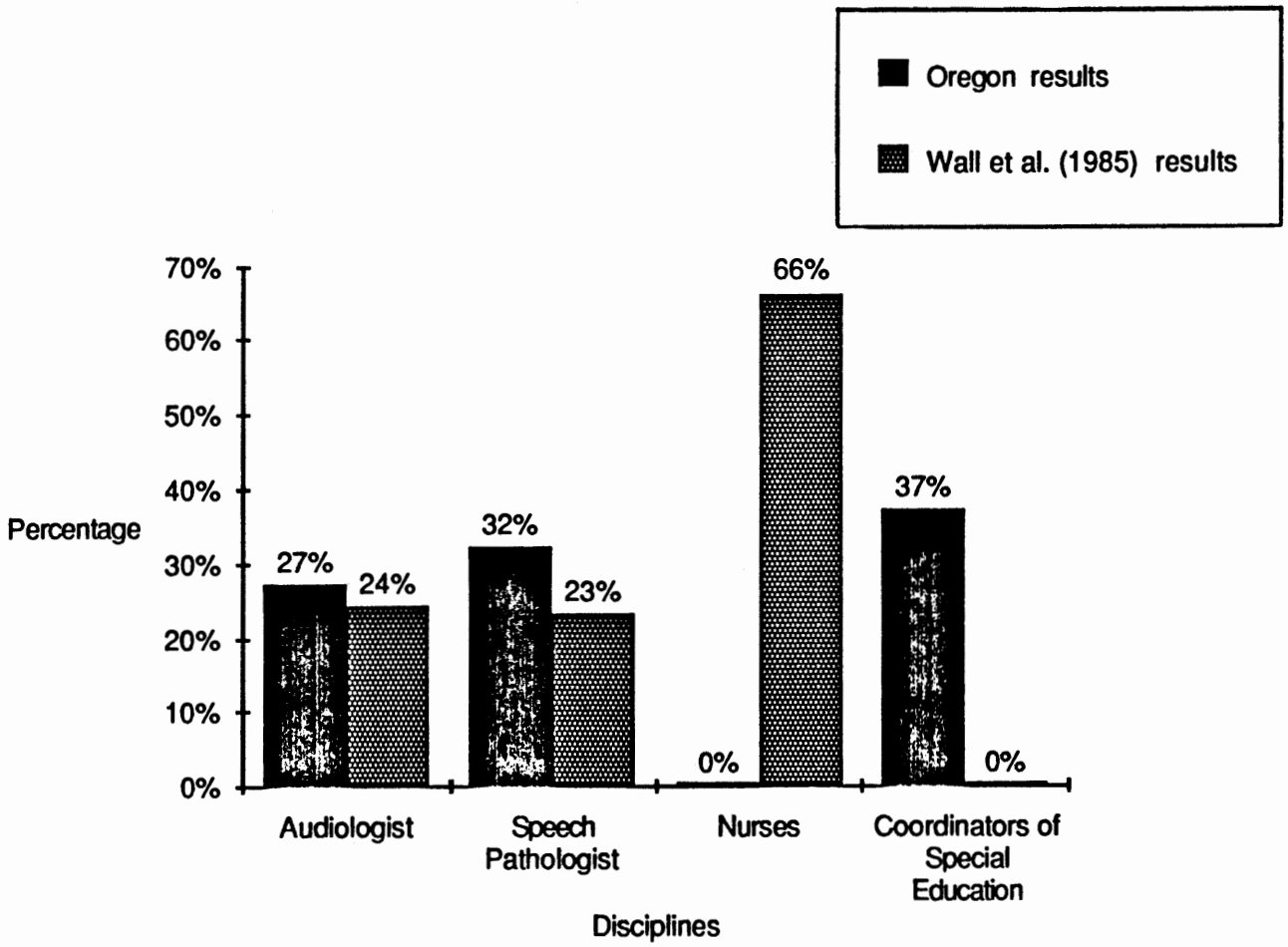

Figure 9. Comparison of supervisors by discipline as reported by Wall et al. (1985) and the Oregon study.

what was observed nationally as compared to Oregon in supervisory disciplines, there were significant differences. For example, the current study, in contrast to Wall et al., discovered that coordinators of special education supervised more districts than any other discipline. On the other hand, Wall et al. (1985) discovered that the majority of supervision was performed by nurses, while no Oregon districts reported nurses as supervisors. The reason for this difference is unclear. It may be due to the recent transfer of responsibility from the Health Division to the local school districts. Further, there may be fewer audiologists involved in the schools in Oregon than there are in other states; in fact, Oregon currently does not issue a certificate for educational audiology through the Department of Education while many other states do. Finally, coordinators of special education may be prime candidates for assuming responsibility for hearing conservation programs since many already supervise other programs, such as vision screening.

While supervisory personnel participated in hearing conservation activities, typically they did not perform the majority of hearing screening services. A variety of disciplines were involved in providing the hearing screening services. ASHA (1985) indicated that anyone trained and supervised by an audiologist may perform the screening. Wall et al. (1985) found that nurses performed the majority (65 percent) of screenings followed by speech-

language pathologists (34 percent), technicians (22 percent), volunteers such as parents, aides, and other concerned people (19 percent) and audiologists (16 percent).

Analyses of the data from the current study revealed that a total of 318 persons performed hearing screening services throughout the state of Oregon. Speech-language pathologists provided the majority of the screening (68 percent). The remainder was performed by persons comprising a category of "others" (43 percent), volunteers (31 percent), and nurses (9 percent). The category of "others" was composed of audiologists, audiometrists, and school personnel such as counselors. The volunteer category was comprised of non-paid participants, such as parents. It should be recognized that many districts utilized more than one person for screening services and that these individuals frequently represented different disciplines. For example, several districts used both nurses and volunteers to screen hearing and middle ear function. Consequently, the total of the percentages of the different categories did not sum to 100. As one may note from a review of Figure 10, Oregon compares quite favorably with the national trend regarding the personnel performing the hearing screening. When non-audiologists are involved in hearing screening, it is recognized that training is an important element in an effective hearing conservation program.

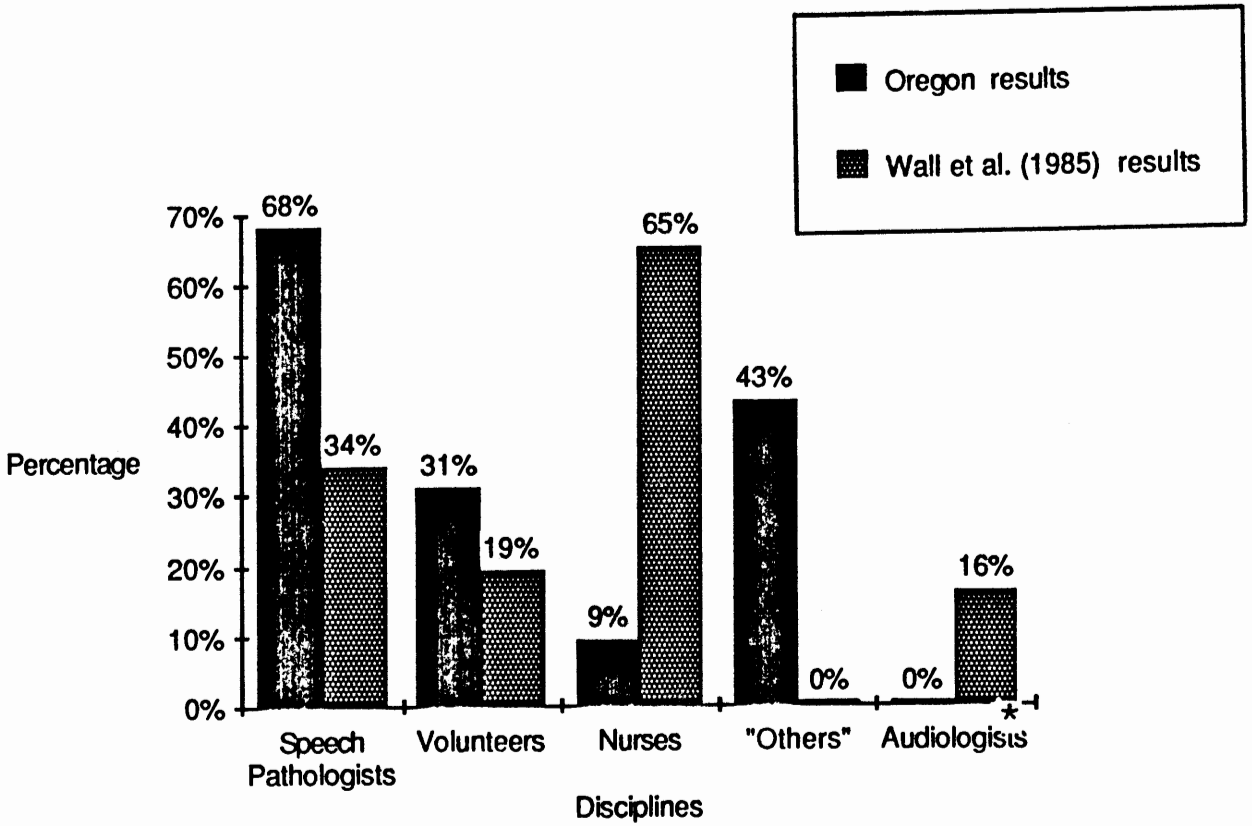

Figure 10. Comparison of persons performing the hearing screening by discipline as reported by Wall et al. (1985) and the Oregon study.

* Audiologists are included in the "Other" category for the Oregon study.

The present study, therefore, investigated the training received by those performing the hearing screening in Oregon public schools. Data demonstrated that training was provided to screening personnel in 179 (66 percent) of the school districts. In those cases where training was available, the majority of it was carried out by the fields of audiology (81 percent), special education (10 percent), speech pathology (7 percent) and nursing (2 percent). The training sessions ranged in length from a 10-minute review to 2 days. There was substantial variability in the nature and focus of training. However, approximately half of the personnel in the 179 districts which received training were provided a complete program; at least 80 percent were trained in the majority of areas listed in the CCD program guide (Pelson and Young, 1983). Most training involved practice testing (91 percent) while 80 percent reviewed the effect of a noisy environment on testing. Most districts which provided training emphasized those topics important to valid screening endeavors. It is important to realize that without training and audiological supervision, such programs may well have provided less than adequate safeguards to maintain program validity. One-third of the school districts were not training the individuals who performed the screening services during 1984-85.

Hearing and Middle Ear Screening Equipment

There were two basic types of equipment utilized in hearing conservation programs: audiometers for screening hearing and immitance instruments for screening middle ear function.

Hearing Screening:

Pure tone audiometers were typically used for hearing screening (Wall et al., 1985). Data analyses of the present study revealed that a total of 272 screening audiometers were utilized throughout the state. Individual districts reported using 1-16 audiometers in their screening program with a mean of approximately 1.0. Seventy-two percent of the districts reported owning audiometers while 41 percent borrowed the instruments. Some districts owned pure tone audiometers but had an insufficient number to meet their needs and hence borrowed equipment to meet these requirements.

Middle Ear Screening:

A total of 91 tympanometers were utilized in Oregon; the range was 0-6 with a mean of .33 per district. These data coincide with those reported by Wall et al. (1985); i.e., approximately one-third of those who performed hearing screening included immitance measures as well. Further data analyses revealed 53 percent of the

tympanometers were owned and 46 percent were loaned. Many districts own tympanometers, but needed to borrow additional screening equipment to met their need.

The Crippled Children's Division (CCD) of the Oregon Health Sciences University provided for a short-term loan policy on both pure tone audiometers and tympanometers to school districts throughout the state. The equipment distributed through CCD was used by many districts with each instrument shared widely throughout the school year between various districts.

It appeared that 89 percent of the school districts had access to an adequate number of audiometers to meet their needs, while only 58 percent of the districts had access to an adequate number to tympanometers.

Of the 26 school districts that did not have access to enough audiometers, 18 (69 percent) stressed their district would support the purchase of such equipment. A total of 100 school districts indicated they did not have access to an adequate number of tympanometers; of this number, 34 (34 percent) believed their district would support the purchase of such an instrument. (It should be noted that supporting the purchase of instruments and actually purchasing the units are two completely separate items). Since the responsibility of maintaining hearing conservation activities had only recently been required by the districts, it seems likely that the schools represented may now be including the purchase of the screening equipment

as well as the cost of calibration in their budgets. However, no data to support this possibility are available.

Calibration and Maintenance

An important area of consideration is the maintenance and calibration of hearing related screening equipment. The use of equipment which needs repair or calibration may be worse than not having a hearing conservation program at all. Depending upon the calibration required, use of malfunctioning instrumentation may result in a significantly high incidence of false positives and thus over-referrals or, conversely, false negatives which result in undetected hearing loss. ASHA (1985) recommended an annual calibration of all equipment. This calibration should meet the American National Standard Specification for Audiometers (S3.6-1969).

Wall et al. (1985) reported that 72 percent of the respondents had their equipment calibrated each year. In comparison, the present study indicated the majority (90 percent) of the districts calibrated their equipment annually. Other schedules of calibration included intervals of six months (4 percent), every other year (.4 percent), every third year (.4 percent), or only when a problem noted (4 percent). It appears that most of the school districts calibrated their equipment within the time frame suggested by ASHA (1985). However, the 4 percent of the districts that had their equipment calibrated only when

they noticed a problem should be familiarized with the potential damage the use of malfunctioning equipment may cause. Further data analyses revealed most of the calibration was done by local or regional repair depots (85 percent); other facilities included the instrument manufacturer (8 percent) and in-district repair (4 percent).

Since equipment may malfunction at any time, daily biological checks of the instrumentation are an integral part of an effective hearing conservation program. ASHA (1985) suggested a gross estimate of equipment function or performance may be accomplished by daily listening checks. Wall et al. (1985) did not discuss this issue. In Oregon, most of the school districts (98 percent) which responded to the survey reported performing biological listening checks of equipment on the day of screening. Such checks included listening to the quality of the tones (90 percent), threshold test on reference ear (88 percent), check of earphone cords (88 percent), check for noisy intensity dial (73 percent), impedance check on reference ear (57 percent) and investigation for cross-talk (44 percent). Fifteen percent of the school districts reported performing other checks, such as a calibration check, and inspecting the condition of the eartips used with the immitance screening. The programs in Oregon appear to monitor their equipment rather well with the exception of real ear immitance equipment checks.

Among the other factors important to effective hearing screening is the noise level within the screening environment. Excessive environmental noise can produce false positive test results which consequently requires more time to rescreen the failures and may result in over-referrals. ASHA recommended using the American National Standard Criteria for Permissible Ambient Noise during Audiometric Testing (S3.1-1977) as a guide in monitoring hearing screening environmental noise. Wall et al. (1985) reported the majority of screening was performed in offices (73 percent), followed by classrooms (28 percent) and other spaces (24 percent). It is doubtful that all of those environments would meet the recommended ambient noise criteria.

Only 73 percent of the Oregon school districts reported a "very quiet" room was available for pure tone screening. Only 8 percent reported the space was guaranteed. Several others indicated it was either not likely available (17 percent) or unavailable (2 percent).

In general, the results of the study demonstrate both strengths and weaknesses within Oregon's present public school hearing conservation endeavors.

Strengths of the present hearing conservation system

One advantage of having the Department of Education assume a leadership role in hearing conservation is that the primary responsibility for monitoring hearing is placed

at the local level. In this situation personnel actually managing the services are a part of the educational system and are directly involved in the educational progress of the recipients. This would seem a much improved condition over the previous one, where a non-educational state agency was responsible. Even when the OSHD hearing conservation program was at maximum staffing levels, there were only three Audiologists and eleven screening Audiometrists to provide services for all the elementary schools within the entire state. Students now identified as having hearing related problems can observe more efficient follow-up and management from local personnel. The situation now is vastly improved.

Data analyses of the present delivery system revealed that most children in kindergarten and first grade levels received effective hearing conservation services. Since these children represent the youngest members within the public education system and since most have not received hearing screening services previously, it is significant that very few of these children are now overlooked. Furthermore, it would appear that with the exception of two sub-categories, most of the "special" children are receiving appropriate hearing related services. Additionally, when training is provided to screening personnel, it is generally adequate. Screening methodology, both in terms of test frequencies and signal intensity level, is consistent with current state and

national recommendations.

Limitations

Virtually none of the second and only about half of all third grade students are receiving hearing conservation services throughout the state. This is also true for a substantial number of "special" children in the sub-categories of teacher referral and previous screening failures. This rather large group of unscreened children is of concern because data analysis revealed that approximately 1 percent of all school children screened will ultimately require some degree of educational management for hearing loss. One can only assume that a large number of children who need these services are not receiving them because the identification program is incomplete.

Supervisors

Public school hearing conservation programs within Oregon show considerable variability in supervisory personnel. However, three disciplines represent the majority of these individuals. While the national model outlined by the American Speech-Language-Hearing Association (ASHA, 1985) and promulgated within Oregon by CCD recommends that Audiologists manage and supervise hearing conservation activities, only 27 percent of the existing programs are supervised by this discipline. In

contrast, 32 percent are managed by Speech-Language Pathologists and 37 percent by coordinators of Special Education. It is not surprising, given that hearing conservation is a relatively new requirement for the elementary school system that Speech-Language Pathology and Special Education are called upon to perform this supervisory role in the majority of cases (69 percent).

There are several reasons for this situation. First, Special Education frequently assumes the role of supervisory position in screening services. Further, this discipline is very prevalent within the school system. Also, Speech-Language Pathologists are frequently involved with hearing impaired children, and they are typically accessible in most school districts and, hence, appear to be available for the supervisory role. Finally, there are relatively few Audiologists currently involved in the Oregon public school educational system. This last situation relates to several variables. Unlike Speech-Language Pathology and Special Education, there is currently no Department of Education certification for Audiology. Moreover, Audiologists traditionally have not been trained to assume a role within the public schools; albeit, this situation is changing with a relatively new area called Educational Audiology. Lastly, Oregon's funding base for public schools allows for little flexibility in expanding or improving service models.

While it is easy to understand why the current

situation exists with supervisory personnel, it seems rather clear that effective hearing conservation requires adequately trained personnel to provide effective services. While Special Education, Speech Pathology and Audiology all play important roles in hearing conservation, the inclusion of Audiologists is essential due to the training they have received. Furthermore, the Oregon and ASHA hearing conservation models highlight the importance of this discipline in the total program, including management aspects.

It might be assumed that a number of the difficulties currently noted throughout Oregon in public school hearing conservation relate largely to the absence of Audiologists in the public schools. In addition to the need for effective and adequate training for hearing screening personnel, it appears that many of the children identified through the screening process are not receiving audiological evaluations prior to medical referral. Related to this, it also must be assumed that many children who do not need this service are receiving medical referral following failure on follow-up screening. Unfortunately, the current project did not allow for an analysis of false positive and false negative identifications during the screening process. While this is a weakness in the present research design, it is believed that the current substantial variability across the state regarding hearing conservation management, training of screening personnel,

and screening methodology would not have allowed for an accurate picture in any case.

Discussion

Based upon the findings of the current project, it seems reasonable to make two recommendations. While it is understood that there are funding problems for the public schools in Oregon, this situation should not stand in the way of improving the current service delivery model. There are two primary recommendations which have the potential for eliminating the problems noted within the public school hearing conservation programs. First, the Department of Education needs to take under consideration the development and implementation of a minimum standard for hearing conservation in the public schools. This minimum standard should mirror the model recommended by the American Speech-Language-Hearing Associaton (ASHA, 1985). This nationally recognized model is the result of over twenty years of study and is supported by considerable research. Second, the Department of Education in cooperation with the Teacher Standards and Practice Commission, and a committee of Educational Audiologists should develop certification standards for Educational Audiology.

While many large school districts are financially capable of funding Educational Audiologists and observing the benefits of this discipline, it is clear that many smaller districts will find this difficult to accomplish on

their own because of limited resources and need. It is entirely reasonable that many smaller districts could cooperatively support an Educational Audiology position and similarly observe the resulting benefits. It seems reasonable to assume that a model could be developed whereby the educational service districts could be the primary resource for hearing conservation services and support for Educational Audiology. As with most things, the evolution of important hearing conservation services within Oregon relates to two inter-related variables, priority and funding.

This chapter has discussed the results of the current study and compared these results with those reported by Wall et al. (1985) and ASHA (1985) guidelines for audiometry. The following chapter will present a summary and implications.

CHAPTER V

SUMMARY AND IMPLICATIONS

Summary

Oregon was one of the first states to recognize the importance of public school hearing conservation. It initiated its first program through the State Department of Health in 1937. Over several years, this program evolved into a comprehensive activity which provided most of the important elements in hearing conservation for school-aged children in the public schools, including identification, follow-up screening, audiological assessment and medical management as well as hearing aid provision.

In 1981 the Oregon State Health Division (OSHD) discontinued its public school direct-service hearing conservation program. For the next two years, limited contractual arrangements were made between the OSHD and various groups to provide some semblence of public school hearing conservation throughout the state. Realizing that this multi-contractual arrangement was ineffective and inequitable, the OSHD entered into a contractual agreement with the Crippled Children's Division (CCD) to provide a variety of services to the elementary public schools in order to assist them with their conservation activities. Included in this service agreement, CCD was to develop and

distribute a hearing conservation program guide, provide inservice training upon request to school districts throughout the state, hold state-wide annual hearing conservation workshops, distribute hearing related screening equipment on a short-term basis, and place hearing aid amplification systems on long term loan to hearing impaired indigent children who had no other available resources. Coincidently, in 1983, the Department of Education put greater emphasis on implementation of OAR 581-22-705 which required all elementary schools to provide hearing screening services. For the first time in Oregon's history, the public schools were required to be responsible for what was viewed by many as a new service.

In general, the schools were unprepared for this new responsibility since it had been previously provided in one form by the Health Division. Further, the schools were given limited warning about the loss of the direct-service aspect provided by the OSHD. Therefore, confusion was observed in several areas, such as: 1) how to set up a hearing conservation program; 2) who should assume primary responsibility; 3) acquisition of hearing related screening equipment; 4) screening personnel; and 5) screening protocol. In anticipation of these problems, the OSHD-CCD contract was implemented to assist the schools with the transition process.

The present study was initiated to access the current status of public school hearing conservation in Oregon

approximately three years after the OSHD terminated its direct-service activities. The results of the study demonstrate both strengths and weaknesses within Oregon's present public school hearing conservation endeavors.

The survey instruments returned for analysis represented 96 percent of those districts with elementary school. Data analyses revealed that most of the children in kindergarten and first grade received effective levels of hearing of hearing conservation services during the school year. In contrast, only 13 percent of the children in the second grade and approximately 51 percent of those in third grade received such services. Although most "special" children received adequate hearing conservation services, only a relatively small number of this group included teacher referrals. Furthermore, children identified as previous screening failures were often overlooked on subsequent screenings.

Considerable variability was observed in supervisory personnel across the state. Three disciplines represent the majority of program coordinators; these are Coordinators of Special Education (37 percent), Speech-Language Pathologists (32 percent), and Audiologists (27 percent). Speech-Language Pathologists performed the majority (68 percent) of the hearing screening related services. Finally, the results indicated that many districts do not provide adequate training to those individuals engaged in hearing related screening

activities.

Implications

Two major recommendations are suggested based upon the results of this study. First, the Oregon Department of Education should consider the development and implementation of a minimum standard for hearing conservation practices in the public school setting. This may be considered a long-term goal which could evolve through subsequent modifications and improvements in the recommendations for hearing conservation practices as outlined in the manual "Health Services for the School-Aged Child." The ultimate goal should be a minimum standard modeled after those recommended by the American Speech-Language-Hearing Association (ASHA, 1985). Second, the Oregon Department of Education in cooperation with the Teacher Standards and Practice Commission and representatives of the Audiology community should cooperatively work together to develop certification standards for Educational Audiology within Oregon. It seems evident that the wide diversity and variability in current hearing conservation practices within the Oregon public school setting would be virtually eliminated should these two recommendations realize positive response.

There are several possibilities for future research in this area: 1) a comparison of the responses given relative to the size of the school district; 2) a

comparison of geographic location of the school district relative to the responses given to specific questions; and 3) distribution of a follow-up questionnaire in approximately two years to determine if a significant change has occurred in hearing conservation practices within the public school setting.

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APPENDIX A

QUESTIONNAIRE: HEARING CONSERVATION PROGRAM (HCP)

Code:_____

QUESTIONNAIRE: HEARING CONSERVATION PROGRAM (HCP)

An effective hearing conservation program (HCP) is made up of several important components. They are:

1. Identification (screening) audiometry
2. Re-screening and possibly middle ear assessment (tympanometry)
3. Audiological examination
4. Medical referral and treatment as needed
5. Educational services and management

Please answer each of the following questions and return the questionnaire in the enclosed self-addressed envelope at your earliest convenience. Circle the correct answer and fill in the appropriate blanks. Thank you.

A. Person answering questionnaire.

Name_____

Address_____

Phone #_____County_____

B. Please indicate below the name(s) of the district(s) represented in this survey.*

_____ _____

_____ _____

* If different services are provided in each district, please fill out a separate questionnaire for individual districts.

C. In the appropriate spaces within the data grid below, please indicate the number of children who received the various needed services.

SERVICES PROVIDED	GRADES (number of children) K	1	2	3	other	other
Initial screening						
Follow-up screening						
Audiological referral						
Hearing related medical referral						
Hearing re-check (after medical referral)						
Management of identified children (special education, preferential seating, amplification, etc.)						

What "special" children are screened (i.e., special education classes, new students in the school system, students who failed hearing screening the previous year, etc.). Please indicate those screened.

_____

_____

D. When is your screening performed? (i.e., Fall, Winter, Spring)

1. Kindergarten_____
2. First grade_____
3. Second grade_____
4. Third grade_____
5. Other_____

E. Who performs the screening portion of your HCP?

1. Volunteers
2. Nurses
3. Speech pathologists
4. Others: please specify

_____

F. Approximately how many persons perform the screening?

1. One
2. Two
3. Three
4. Four or more; how many?____

G. Approximately how long does it take to complete the screening?

1. _____days

H. Who currently supervises your HCP?

1. Special education coordinator
2. Speech pathologist
3. Audiologist
4. School Administrator
5. Other; please identify:

_____

I. Does your district's (school's) HCP provide those performing the hearing and middle ear screening with training sessions?

1. Yes
2. No

If you answered no, skip to question J. If you answered yes, how long are the training sessions? _____

Who provides the training?

1. Audiology
2. Speech pathology
3. Nursing
4. Special education

Please identify the major components of the training activities. Circle all that apply.

1. What is hearing loss?
2. Effect of hearing loss on learning
3. Screening methodology
4. Practice testing
5. Environmental noise problems
6. Pass/fail criteria
7. Other_____

J. Please identify the components of your HCP. Circle all that apply.

1. Pure tone screening
2. Tympanometry
3. Audiological referral
4. Medical referral
5. Hearing re-check after referral
6. Educational considerations

K. Which of the following best describes your referral criteria?

1. Audiological referral after failing initial hearing screening
2. Medical referral after failing initial hearing screening
3. Audiological referral after failing follow-up hearing screening
4. Medical referral after failing follow-up hearing screening
5. Other; please specify_____

L. What frequencies are screened in your HCP? Circle those used in your program.

1. 250Hz
2. 500Hz
3. 1000Hz
4. 2000Hz
5. 4000Hz
6. 6000Hz
7. Other(s):_____,_____

M. What signal intensity does your program use?

1. 15dB HTL
2. 20dB HTL
3. 25dB HTL
4. Other:_____

N. Does your district perform its own screening or does it contract this service with someone?

1. Performs own
2. Contract basis

If your answer to question N was "contract basis" please indicate with whom your district presently has a contract for these services:

_____

O. How many pure tone screening audiometers does your district (school) HCP have available for screening purposes?

1. None
2. One
3. Two
4. Three or more;how many?____

These audiometers are:

1. Owned by the district
2. Loaned to district

P. How many screening tympanometers does your HCP have available for middle ear testing?

1. None
2. One
3. Two
4. Three or more;how many?____

These tympanometers are:

1. Owned by the district
2. Loaned to district

Q. Does your district (school) have access to the number of screening instruments to meet your needs?

1. Pure tone audiometers: (A) Yes (B) No
2. Tympanometers: (A) Yes (B) No

If your answer to question Q was no in either case, please answer the following: Do you believe your district (school) will support the purchase of basic screening equipment?

1. Pure tone audiometers: (A) Yes (B) No
2. Tympanometers: (A) Yes (B) No

R. How often are your screening audiometers sent out for calibration?

1. Six month intervals
2. Yearly (annual)
3. Every other year
4. Every third year
5. Only when problem noted
6. Never
7. Other:_____

S. Who performs your equipment calibration?

1. Manufacturer (factory)
2. Local or regional repair depot
3. In-district repair facility
4. No-one

T. Do the personnel actually doing the hearing and/or middle ear screening perform biological listening checks of the equipment on the day of testing?

1. Yes
2. No

U. If your answer to question T was "yes," what checks are performed? Circle all that apply to your program.

1. Threshold test on reference ear
2. Check earphone cords
3. Check for cross-talk
4. Check for noisy intensity dial
5. Listen to quality of tones
6. Impedance check on reference ear
7. _____

V. Have you experienced a problem obtaining a "very quiet" room for pure tone testing (adequate to screen at 20dB HTL)?

1. Space guaranteed
2. Usually available
3. Not likely available
4. Unavailable

W. What educational services are provided for those children with confirmed hearing loss? Circle all that apply to your program.

1. Preferential seating
2. Educational placement
3. Resource room
4. Speech and language
5. Hearing re-check
6. Amplification

APPENDIX B

INITIAL MEMO

DEPARTMENT OF EDUCATION
700 PRINGLE PARKWAY SE
SALEM OREGON 97310

OFFICE OF THE SUPERINTENDENT

October 4, 1984

MEMORANDUM NO. 18-1984-85

TO: School Superintendents of Elementary Districts
Private Elementary Schools

RE: Hearing Screening

In March, 1985, we plan to distribute a hearing screening survey instrument to collect data on such items as how many children are screened, at what grade levels, who does the screening, what equipment was used, etc. We are sending you advance notices in order that you can be prepared to provide this information to us.

The Oregon Department of Education and the Crippled Children's Division are cooperating in this effort. Please enter the name of your contact person for hearing screening on the form below and mail to the CCD in the self addressed envelope. If you need technical assistance or equipment, feel free to contact Dr. Rodney Pelson at 225-8356.

[redacted]

Patricia A. Ellis
Associate Superintendent
Special Education and
Student Services Division
(503) 378-2265

LA:ia 962

Person responsible for your Hearing Screening Program:

Name: _____ Phone: _____

School District: _____ County: _____

School: _____

Address: _____

_____

APPENDIX C

FOLLOW-UP MEMO

VERNE A. DUNCAN
State Superintendent
of Public Instruction

OREGON DEPARTMENT OF EDUCATION
700 PRINGLE PARKWAY SE, SALEM, OREGON 97310 PHONE (503) 378-3569

December 28, 1984

TO: School Superintendents of Districts with Elementary Schools

Re: Hearing Screening

This memo is a follow-up on information requested from you in my memo of October 4, 1984. We have not received, from your district, the name of the person responsible for your Hearing Screening Program.

The information will help us to distribute the hearing screening survey instrument in March, 1985, to the person who can provide the necessary information. Please enter the name of the contact person for hearing screening on the form below and mail to the person indicated. If you have questions, please contact Dr. Rodney Pelson at 225-8356.

[redacted]

Patricia A. Ellis
Associate Superintendent
Special Education and
Student Services Division
(503) 378-2265

LA:ia 1302S

- -

Person responsible for your Hearing Screening Program:

Name _____ Phone _____

School District _____ County _____

Address _____

_____

_____

Please return this form to: Dr. Rodney Pelson, Coordinator
Oregon Hearing Conservation Program
Crippled Children's Division
PO Box 574
Portland, OR 97297

APPENDIX D

COVER LETTER

VERNE A. DUNCAN
State Superintendent
of Public Instruction

OREGON DEPARTMENT OF EDUCATION
700 PRINGLE PARKWAY SE, SALEM, OREGON 97310 PHONE (503) 378-3600

March 1, 1985

TO: Hearing Conservation Contact Person

RE: Questionnaire on Hearing Conservation Program

In October, 1984, I sent a memo to school districts alerting them that a survey would be conducted in March, 1985, to collect data on hearing conservation programs and requesting the name of the person responsible for the Hearing Conservation Program. You were identified as a contact person.

The Oregon Department of Education and the Oregon Hearing Conservation Program of the Crippled Children's Division are cooperating in this effort to collect the data and to assist school districts in providing these programs for their students.

The first step in this process is to collect data on what is currently being provided across the state. This information will be used as a base line for making a status report and future comparisons. Results of the survey will be sent to you and district superintendents when the report is completed.

Please complete the questionnaire and return it in the enclosed self-addressed envelope by April 5, 1985.

If you have any questions, feel free to contact Dr. Rodney O. Pelson or Jill Testik at 225-8074 or leave a message at 225-8356.

Cordially,

[redacted]

Patricia A. Ellis
Associate Superintendent
Special Education and
Student Services Division
(503) 378-2265

LA:ia 1455S

Enclosure